passing the summit of the mountain the precipitation diminishes more slowly than was found under our previous assumption of a constant thickness of clouds. In reality, on account of the conveying of the water or ice with the cloud, which we still neglect as before, the maximum of precipitation is pushed still more toward the summit of the mountain. Moreover, since one part of the cloud floats over the summit and is there dissipated in the sinking or descending currents of air, the precipitation will stretch a little beyond the summit, but its total quantity will be less than the computed.

The results of the preceding analysis, namely, that there exists a zone of maximum precipitation on the windward slope of a mountain and that the inclination of the surface of the earth is more important in determining the quantity of precipitation than is its absolute elevation, is conformed by observations, at least for the higher mountains.[11]

ON THE IONISATION OF ATMOSPHERIC AIR.

By C. T. R. WILSON, M. A., F. R. S., dated February 1, from the proceedings, Royal Society, Vol. LXVIII, pp. 151-161, May 4, 1901.

The present communication contains an account of some of the results of investigations undertaken for the Meteorological Council with the object of throwing light on the phenomena of atmospheric electricity.

In a paper[1] containing an account of the results arrived at during the earlier stages of the investigation I described the behavior of positively and negatively charged ions as nuclei on which water vapor may condense.

The question whether free ions are likely to occur under such conditions as would make these experimental results applicable to the explanation of atmospheric phenomena was left undecided in that paper. My first experiments[2] on condensation phenomena had, it is true, proved that in ordinary dust-free, moist air a very few nuclei are always present requiring, in order that water should condense upon them, exactly the same degree of supersaturation as the nuclei produced in enormously greater numbers by Röntgen rays, and I concluded that they are identical with them in nature and that they are probably ions[3]. While, however, later experiments proved that the nuclei formed by Röntgen or uranium rays can be removed by an electric field and are, therefore, ions; similar experiments made with the nuclei which occur in the absence of ionising radiation led to negative results[4]. In the light of facts brought forward in the present paper I should now feel disposed to attribute the negative character of the results in the latter case to the small number of nuclei present[5].

Subsequently to the publication of the work on the behavior of ions as condensation nuclei, Elster and Geitel showed that an electrified conductor exposed in the open air or in a room lost its charge by leakage through the air, and that the facts concerning this conduction of electricity through the air are most readily explained on the supposition that positively and negatively charged ions are present in the atmosphere. The question where and how these ions are produced remained, however, undetermined; it would, therefore, be incorrect to assume their properties, and in particular their behavior as condensation nuclei to be necessarily identical with those of freshly produced ions; the carriers of the charge might consist of much more considerable aggregates of matter than those attached to the ions with which the condensation experiments had been concerned. Moreover, so long as the source and conditions of production of these ions remained undetermined, one could not assume their presence in the regions of the atmosphere where supersaturation might be expected to occur.

Before going further afield in search of possible sources of ionisation of the atmospheric air, it seemed advisable to make further attempts to determine whether a certain degree of ionisation might not be a normal property of air, in spite of the somewhat ambiguous results given by the condensation experiments to which I have referred.

After much time had been spent in attempts to devise some satisfactory method of obtaining a continuous production of drops from the supersaturated condition, I abandoned the condensation method and resolved to try the purely electrical method of detecting ionisation. Attacked from this side, the problem resolves itself into the question: Does an insulated-charged conductor suspended within a closed vessel containing dust-free air lose its charge otherwise than through its supports when its potential is well below that required to cause luminous discharges?

Several investigators from the time of Coulomb onward have believed that there is a loss of electricity from a charged body suspended in air in a closed vessel in addition to what can be accounted for by leakage through the supports.[6] In recent years, however, the generally accepted view seems to have been that such leakage through the air is to be attributed to the convection of the charge by dust particles.

The experiments were begun in July, 1900, and immediately led to positive results. A summary of the principal conclusions then arrived at was given in a preliminary note "On the leakage of electricity through dust-free air," read before the Cambridge Philosophical Society on November 26. Almost simultaneously a paper by Geitel appeared in the Physikalische Zeitschrift[7] on the same subject, in which identical conclusions were arrived at in spite of great differences in the methods employed.

The following are the results included in the preliminary note, which I read:

1. If a charged conductor be suspended in a vessel containing dust-free air, there is a continual leakage of electricity from the conductor through the air.
2. The leakage takes place in the dark at the same rate as in the diffuse daylight.
3. The rate of leak is the same for positive as for negative charges.
4. The quantity lost per second is the same when the initial potential is 120 volts as when it is 210 volts.
5. The rate of leak is approximately proportional to the pressure.
6. The loss of charge per second is such as would result from the production of about twenty ions of either sign in each cubic centimeter per second in air at atmospheric pressure.

Of these conclusions the first four were also arrived at by Geitel.

As Geitel has pointed out, Matteuci[8] as early as 1850, had arrived at the conclusion that the rate of loss of electricity is independent of the potential. He had also noticed the decrease in the leakage as the pressure lowered.[9]

The volume of air used in my experiments was small, less than 500 cubic centimeters in every case, many of the measure-

[11] See Hann "Klimatologie," Vol. I, p. 298.

[1] Phil. Trans., A., vol. 193, pp. 289-308.

[2] Roy. Soc. Proc., vol. 59, p. 338, 1896.

[3] Camb. Phil. Sec. Proc., vol. 9, p. 337.

[4] Phil. Trans., A., vol. 193, pp. 289-308.

[5] The similar results obtained with nuclei produced in air exposed to ultraviolet light require, however, some other explanation.

[6] Perhaps the most convincing evidence of this is furnished by the experiments of Professor Boys, described in a paper on Quartz as an insulator. Phil. Mag., vol. 28, p. 14, 1889.

[7] Physikalische Zeitschrift, 2 Jahrgang, No. 8, pp. 116-119, published November 24.

[8] Annales de Chim. et de Phys., vol. 28, p. 385, 1850.

[9] This was also observed by Warburg, Annalen der Physik u. Chemie, vol. 145, p. 578, 1872.

ments being made with a vessel containing only 163 cubic centimeters. This made it much more easy to insure the freedom of the air from dust particles. Geitel worked with volumes amounting to about 30 liters; his observations show the interesting phenomenon of a gradual increase of the conductivity of the air in the vessel toward a limiting value, which was only attained when the air had been standing in the vessel for several days. This, as Geitel points out, is to be explained by the gradual settling of the dust particles, the conductivity of the air being greatest when there are no dust particles present to entangle the ions.

The principal difficulty in the way of obtaining a decisive answer to the question whether any leakage of electricity takes place through dust-free air is the fact that one is so liable to be misled by the leakage due to the insulating support. As will be seen from the description which follows, this source of uncertainty was entirely eliminated in the method which I adopted. It had, moreover, the advantage of reducing to the smallest possible value the capacity of the conducting system in which any loss of charge is measured by the fall of potential.

The conducting system, from which any leakage is to be detected and measured, consists solely of a narrow metal strip (with a narrow gold leaf attached to indicate the potential), fixed by means of a small bead of sulphur to a conducting rod which is maintained at a constant potential equal to the initial potential of the gold leaf and strip. With this arrangement, if any continuous fall of potential is indicated by the gold leaf, it can only be due to leakage through the air; any conduction by way of the sulphur head can only be in such a direction as to cause the leakage through the air to be underestimated.

The form of apparatus used in all the later experiments is indicated in fig. 1. [Omitted.] The gold leaf and thin brass strip to which it was attached were placed within a thin glass bulb of 163 cubic centimeters capacity; the inner surface of the bulb being coated with a layer of silver so thin that the gold leaf could readily be seen through the silvered glass. The upper end of the strip had a narrow prolongation, by means of which it was attached by a sulphur bead of about two millimeters in diameter to the lower end of the brass supporting rod. The latter passed axially through the neck of the bulb, its lower end just reaching to the point where the neck joined the bulb. The interior of the neck of the bulb was thickly silvered to secure efficient electrical connection between the thin silver coating of the inside of the bulb and a platinum wire sealed through the side of the tube. The platinum wire was connected to the earthed terminal of a condenser consisting of zinc plates embedded in sulphur, the other terminal of the condenser being connected to the brass supporting rod and maintaining it at a nearly constant potential. An Exner electroscope connected to the same terminal of the condenser was used to test the constancy of the potential, and any loss could from time to time be made up by contact with a rubbed ebonite rod or a miniature electrophorus.

Both the gold leaf of which the motion served to measure the leakage, which was the subject of investigation, and that of the Exner electrometer were read by means of microscopes provided with eye-piece micrometers.

To give the leaking system an initial potential equal to that of the supporting rod, momentary electrical connection between them was made by means of a magnetic contact maker. This consisted of a fine steel wire fixed to the supporting rod near its upper end and extending just below the sulphur bead, where it was bent into a loop surrounding the prolongation of the brass strip which carried the gold leaf. A magnet brought near the outside of the tube attracted the wire until the loop came in contact with the brass and brought it into electrical communication with the supporting rod. This operation was repeated every time the potential of the leaking system had fallen so far that the gold leaf approached the lower end of the scale. The potential of the supporting rod was not allowed to vary by more than a very few volts, and before each reading of the potential of the leaking system was always brought to within a fraction of a volt of its initial value; the Exner electroscope served to indicate when this was the case. The initial difference of potential used in most of the experiments amounted to about 200 volts.

To determine the fall in potential corresponding to a movement of the gold leaf through one scale division, a series of Clark cells was inserted between the condenser and its earth connection, and the number of scale divisions through which the gold leaf moved on reversing the Clark cells was determined; contact between the leaking system and its supporting rod being of course made before and after the reversal. The scale values of the Exner electrometer were determined similarly.

In the apparatus now described, a movement of the gold leaf of the leaking system through one scale division corresponded to a fall of potential ranging from 0.56 volt at the top of the micrometer scale to 0.60 volt at the bottom of the scale.

Any imperfection in the insulating power of the sulphur bead will, as we have seen, tend to give too low a value for the leakage. The error thus introduced was, however, found to be negligible; for the rate of fall of potential of the leaking system was sensibly the same when its potential was equal to that of the supporting rod as toward the close of an experiment when this difference was greatest.

The apparatus used in the earlier experiments differed in some respects from that which has just been described. The vessel was of brass, in the form of a short cylinder, 6 centimeters long and 5 centimeters in radius, the flat ends being vertical, each being provided with a rectangular window closed by a glass plate, so that the position of the gold leaf might be read. A purely mechanical contact maker was used instead of the magnetic one. With the voltage usually employed, a movement of the gold leaf over one scale division corresponded to a change of potential of 0.36 volt.

With this apparatus filled with air at atmospheric pressure (whether this had been filtered or had merely been allowed to stand for some hours in the apparatus), a continuous fall of potential of about 4.0 volts per hour occurred, showing no tendency to diminish even after many weeks. Contact had to be made with the supporting rod (kept as described at constant potential by means of the condenser), about once in twelve hours to prevent the image of the gold leaf from going off the scale of the microscope.

Although care had been taken to avoid bringing the apparatus, during or after its construction, into any room where radio-active substances had been used, it was considered desirable to repeat the experiments elsewhere than in the Cavendish Laboratory (where contamination by such substances might be feared), and with pure country air in the apparatus. Experiments were therefore carried out at Peebles during the month of September, but with the same results as before obtained.

The rate of leakage was the same during the night as during the day, and was not diminished by completely darkening the room in which the experiments were carried out. It is plainly, therefore, not due to the action of light.

It might be considered as possible that the conducting power of the air was due to some effect of the walls of the apparatus, related perhaps to the Russell[10] photographic effect and the nucleus-producing[11] effects of metals. These effects, however, are in the case of brass certainly very slight (I have

[10] Russell, Roy. Soc. Proc., vol. 61, p. 424, 1897; vol. 63, p. 102, 1898.
[11] Wilson, Phil. Trans., A, vol. 192, p. 431.

not been able to detect any cloud-nuclei arising from the presence of brass); they are enormously greater in the case of amalgamated zinc, yet the presence of a piece of amalgamated zinc in the apparatus was without effect on the rate of leak. If then the walls of the vessel influence in any way the ionisation of the air in the vessel, this influence is not proportional to the photographic or nucleus-producing effects of the metals.

To find the loss of electricity corresponding to the observed fall of potential of the leaking system, the condenser was removed, and the capacity of the Exner electroscope, with the connecting wires and the rod supporting the leaking system, was first determined by finding the fall of potential resulting from contact with a brass sphere of which the radius was 2.13 centimeters. The sphere, suspended by a silk thread, was in contact with a thin earth-connected wire, except when momentarily drawn aside by a second silk thread and brought into contact with the end of another thin wire leading to the electroscope. Except for these two wires the sphere was at a distance great compared with its radius from all other conductors. The rise of potential which occurred in the leaking system after a momentary contact with the system consisting of the supporting rod, electroscope and connecting wires was then compared with the simultaneous fall of potential of the latter system. The loss of electricity corresponding to a given fall of potential of the leaking system was thus obtained. It was found to be sensibly the same for potentials in the neighborhood of 100 volts as for the higher voltages (about 200 volts) generally used, the variations in capacity due to the change of position of the gold leaf being too small to be detected. The system had a practically constant capacity equal to 1.1 cubic meter.

It was possible now to compare the rates of leakage for different strengths of the electric field.

Brass apparatus used, air at atmospheric pressure.

Initial difference of potential.	Fall of potential per hour.
Volts.	*Volts.*
210	4.1
120	4.0

The leakage of electricity through the air is thus the same for a potential difference between the leaking system and the walls of the vessel of 210 volts as for one of 120 volts. On the view that the conduction is due to the continual production of ions throughout the air, this is easily explained as indicating that the saturation current has been attained; the field being sufficiently strong to cause practically all the ions which are produced to reach the electrodes; the number destroyed by recombination being negligible in comparison with those removed by contact with the electrodes. Thus under the conditions of the experiments the loss of electricity from the leaking system in a given time is, if the charge be positive, equal to the total charge carried by all the negative ions produced in the vessel in that time.

The sum of the charges of all the negative ions (or of all the positive ions) set free in the vessels is thus $1.1 \times 4.1/300$ electric units per hour, or 4.3×10^{-6} electric units per second. If we divide by 471 the volume of the vessel in cubic centimeters we obtain for the charge on all the ions of each sign set free in each cubic centimeter per second, 9.1×10^{-9} electric units. Finally, taking 6.5×10^{-10} electric units, the value found by J. J. Thomson, as the charge on one ion, we find that about 14 ions of each sign are produced in each cubic centimeter per second.

There are, however, two defects in the older form of apparatus, with which the above results were obtained, tending to make this number too small; first, the field in the corners where the flat ends meet the cylindrical wall must be very much weaker than elsewhere, and some of the ions set free in these regions may have time to recombine, although the strength of the field throughout most of the vessel is more than sufficient for "saturation;" second, since in this apparatus both the rod supporting the leaking system and the contact maker projected for about a centimeter into the interior of the vessel, a certain proportion of the ions set free would be caught by them and not by the leaking system.

These defects are avoided in the other apparatus which has been described, fig. 1, [omitted.]

In this apparatus the capacity of the leaking system was 0.73 cubic meters. The constant potential of the supporting rod, and thus the initial potential of the leaking system, was in all cases about 220 volts.

At atmospheric pressure the fall of the potential per hour was found to be 2.9 volts. The loss of charge was, therefore, $0.73 \times 2.9/300 = 7.1 \times 10^{-3}$ electric units per hour $= 2.0 \times 10^{-6}$ electric units per second. This is the total charge carried by all the positive ions, or by all the negative ions set free per second. The volume of the bulk being 163 cubic centimeters, the charge on the positive or negative ions set free per second in each cubic centimeter $= 2.0 \times 10^{-6} / 163 = 1.2 \times 10^{-8}$ electric units, and the number of ions of either sign set free per second in each cubic centimeter $= 1.2 \times 10^{-8} / 6.5 \times 10^{-10} = 19$. This is somewhat greater than the number obtained before, but, as was pointed out above, there were sources of error in the older apparatus tending to give too low a result for the rate of production of ions per cubic centimeter.

Experiments were now made on the variation of the rate of leak with pressure. The measurements were made at a temperature of about 15° C. Each experiment gave the leakage in a period varying from six to twenty-four hours. The silvered glass apparatus was used.

The following results were obtained:

Pressure in millimeters.	Leakage in volts per hour.	Leakage / pressure.
43	0.22	0.0052
89	0.53	0.0058
220	1.14	0.0052
341	1.59	0.0047
533	2.30	0.0043
619	2.40	0.0039
635	2.65	0.0042
731	2.78	0.0038
743	2.99	0.0040

These numbers show that the leakage is approximately proportional to the pressure. While the pressure is varied from 43 milimeters to 743 milimeters, the ratio of leakage to pressure only varies between 0.0038 and 0.0058. Since the individual measurements of the leakage at a given pressure differed among themselves by as much as 10 per cent, it would hardly be safe until more accurate experiments have been performed to base any conclusions on the apparent departure from exact proportionality between leakage and pressure. From these results one would infer that it should be impossible to detect any leakage through air at really low pressures. This is in agreement with the observations of Crookes,[12] who found that a pair of gold leaves could maintain their charge for months in a high vacuum.

Experiments were now carried out to test whether the continuous production of ions in dust-free air could be explained as being due to radiation from sources outside our atmosphere, possibly radiation like Röntgen rays or like cathode rays, but of enormously greater penetrating power. The ex-

[12] Roy. Soc. Proc., vol. 28, p. 347, 1879.

periments consisted in first observing the rate of leakage through the air in a closed vessel as before, the apparatus being then taken into an underground tunnel and the observations repeated there. If the ionisation were due to such a cause, we should expect to observe a smaller leakage underground on account of absorption of the rays by the rocks above the tunnel.

For these experiments a portable apparatus had to be made, shown in fig. 2 [omitted]. It differed from that already described (fig. 1) in the following respects: The vessel of thinly silvered glass as before, was inverted and attached directly to the sulphur condenser, its neck being imbedded in the sulphur. The electroscope formerly used to test the consistancy of the potential of the supporting rod was dispensed with; all need for external wires was thus removed. Only the end of the wire by which the charge was put into the condenser protruded from the sulphur, and this was covered as shown in the figure, except at the moment of charging, by a small bottle containing calcium chloride; this fitted tightly on a conical projection of the sulphur through the center of which the wire passed. The sufficient constancy of potential of the supporting rod under these conditions was shown by the fact that when it had been put, by means of the magnet, in momentary electrical connection with the leaking system a second contact, made twenty-four hours later, caused the gold leaf, which indicated the potential, to return to within two micrometer scale divisions of its position immediately after the first contract. The change in the potential of the leaking system produced by such a change in the potential of the support was much too small to be detected.

The experiments with this apparatus were carried out at Peebles. The mean rate of leak when the apparatus was in an ordinary room amounted to 6.6 divisions of the micrometer scale per hour. An experiment made in the Caledonian Railway tunnel near Peebles (at night after the traffic had ceased) gave a leakage of 7.0 divisions per hour, the fall of potential amounting to 14 scale divisions in the two hours for which the experiment lasted. The difference is well within the range of experimental errors. There is thus no evidence of any falling off of the rate of production of ions in the vessel, although there were many feet of solid rock overhead.

It is unlikely, therefore, that the ionisation is due to radiation which has traversed our atmosphere; it seems to be, as Geitel concludes, a property of the air itself.

The experiments described in this paper were carried out with ordinary atmospheric air, which had in most cases been filtered through a tightly fitting plug of wool. The air was not dried and no experiments have yet been made to determine whether the ionisation depends on the amount of moisture in the air.

It can hardly be doubted that the very few nuclei which can always be detected in moist air by the expansion method, provided the expansion be great enough to catch ions, are themselves ions merely made visible by the expansion, not, as some former experiments seemed to suggest, produced by it. The negative results then obtained, in attempts to to remove the nuclei by a strong electric field, may, perhaps, be explained if we consider that all ions set free in the interval during which the supersaturation exceeds the value necessary to make water condense upon them, are necessarily caught, so that complete absence of drops is not to be expected even with the strongest fields.

The principal results arrived at in this investigation are (1) that ions are continually being produced in atmospheric air (as is proved also by Geitel's experiments), and (2) that the number of each kind (positively and negatively charged) produced per second in each cubic centimeter amounts to about twenty.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San Jose de Costa Rica, during April, 1901.*

Hours.	Pressure. Observed, 1901.	Pressure. Normal, 1889-1900.	Temperature. Observed, 1901.	Temperature. Normal, 1889-1900.	Relative humidity. Observed, 1901.	Relative humidity. Normal, 1889-1900.	Rainfall. Observed, 1901.	Rainfall. Normal, 1889-1900.	Rainfall. Duration, 1901.
	660+ *Mm.*	660+ *Mm.*	° *C.*	° *C.*	%	%	*Mm.*	*Mm.*	*Hrs.*
1 a. m.	4.33	3.84	17.01	17.37	80	84	0.0	0.6	0.00
2 a. m.	3.99	3.47	16.68	17.13	79	85	0.0	0.2	0.00
3 a. m.	3.74	3.23	16.60	16.93	80	85	0.0	0.0	0.00
4 a. m.	3.72	3.21	16.38	16.82	81	84	0.0	0.3	0.00
5 a. m.	3.90	3.44	16.17	16.73	81	84	0.0	0.1	0.00
6 a. m.	4.03	3.79	16.24	16.80	80	84	0.6	0.1	0.67
7 a. m.	4.52	4.21	18.11	18.56	73	79	0.2	1.2	0.25
8 a. m.	4.75	4.52	20.58	20.68	63	70	0.0	1.2	0.00
9 a. m.	4.86	4.66	22.67	22.59	56	64	0.0	0.2	0.00
10 a. m.	4.77	4.56	24.63	24.53	50	56	0.0	1.2	0.00
11 a. m.	4.52	4.35	25.07	25.32	49	52	0.0	0.1	0.00
12 m.	4.00	3.92	26.34	25.94	47	55	0.0	0.7	0.00
1 p. m.	3.54	3.30	26.55	26.20	48	55	0.0	1.6	0.00
2 p. m.	3.12	2.81	26.38	25.36	50	59	0.0	3.2	0.00
3 p. m.	2.86	2.55	25.18	23.98	55	63	0.0	8.1	0.00
4 p. m.	2.81	2.52	23.63	22.54	60	68	0.0	4.9	0.00
5 p. m.	3.01	2.72	21.84	21.30	67	73	0.0	5.9	0.00
6 p. m.	3.97	3.19	24.40	20.11	72	76	0.0	4.4	0.00
7 p. m.	3.83	3.65	19.54	19.24	76	81	0.0	3.7	0.00
8 p. m.	4.34	4.03	18.94	18.80	79	82	0.0	2.1	0.00
9 p. m.	4.53	4.35	18.52	18.45	77	83	0.0	1.3	0.00
10 p. m.	4.98	4.64	18.12	18.07	78	84	0.0	1.2	0.00
11 p. m.	4.99	4.60	17.71	17.74	79	85	0.0	1.5	0.00
Midnight	4.74	4.29	17.24	17.53	80	85	0.0	0.7	0.00
Mean	664.08	663.75	20.47	20.36	68	74	......	......	......
Minimum	661.20	660.43	12.3	10.8	......	......	......	......	......
Maximum	666.60	667.12	32.5	34.7	......	......	0.6	8.1	......
Total	......	......	......	......	......	......	0.8	42.8	0.92

REMARKS.—The barometer is 1,169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The dry and wet bulb thermometers are 1.5 meters above ground and corrected for instrumental errors. The hourly readings for pressure, wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The hourly rainfall is as given by Hottinger's self-register, checked once a day. The standard rain gage is 1.5 meters above ground.

TABLE 2.

Time.	Sunshine. Observed, 1901.	Sunshine. Normal, 1889-1.00.	Cloudiness observed, 1901.	Temperature of the soil at depth of— 0.15 *m.*	0.30 *m.*	0.60 *m.*	1.20 *m.*	3.00 *m.*
	Hours.	*Hours.*	%	° *C.*	° *C.*	° *C.*	° *C.*	° *C.*
7 a.m.	8.50	13.16	44	22.44	22.83	23.03	21.75	20.96
8 a.m.	23.25	21.78						
9 a.m.	23.82	22.14						
10 a.m.	22.80	21.84	47	22.92	22.91	23.07	21.86	....
11 a.m.	20.88	21.58						
12 m.	21.59	20.09						
1 p.m.	22.84	19.81	53	23.79	23.25	23.13	21.85	....
2 p.m.	22.50	19.25						
3 p.m.	20.43	15.80						
4 p.m.	17.34	13.34	60	23.92	23.35	23.11	21.77	....
5 p.m.	12.74	9.86						
6 p.m.	5.51	4.95						
7 p.m.	....	....	52	23.60	23.32	23.06	21.74	....
8 p.m.	....	....						
9 p.m.	....	....						
10 p.m.	....	....	34	23.30	23.22	23.03	21.73	....
11 p.m.	....	....						
Midnight	....	....						
Mean	....	....	48	23.35	23.19	23.09	21.80	20.96
Total	222.20	205.59	....	....	....	....	....	....

Notes on the weather.—During the first seven days of the month there were protracted calms and other indications of an early beginning of the rainy season, but on the 8th the northeast monsoons began to blow again permanently, with a high relative pressure of the air until the 17th, inclusive. The 18th and 19th were close and warm, with threats of rain